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(11) Publication number : **0 553 803 A1**

(12)

EUROPEAN PATENT APPLICATION

(21) Application number : **93101244.7**

(51) Int. Cl.⁵ : **A47L 15/00, D06F 35/00**

(22) Date of filing : **28.01.93**

(30) Priority : **31.01.92 IT TO920071**

(43) Date of publication of application :
04.08.93 Bulletin 93/31

(84) Designated Contracting States :
DE ES FR GB

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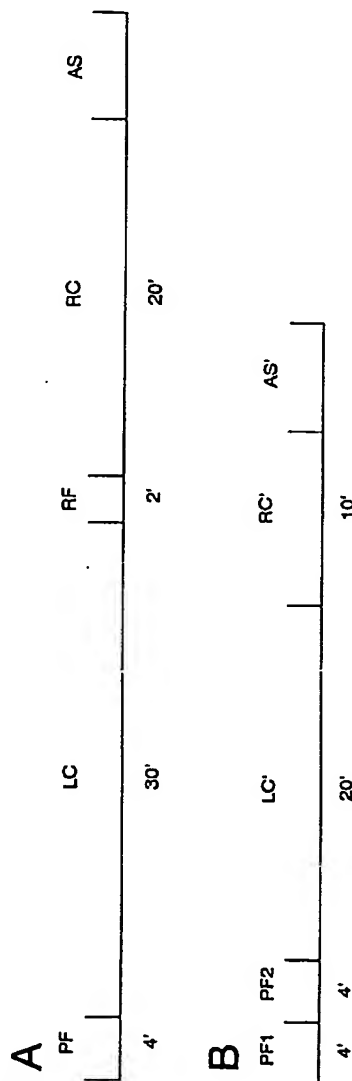
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(54) **Improved dishwashing machine.**

(57) A dish-washing machine is described having various washing programs comprising one or more phases (pre-wash, washing, rinse, etc) apt to be utilized preferably for the washing of domestic dishes.

The main characteristic of the described dish-washing machine is that of providing a program particularly apt for the removal of fresh residues from the dishes, that comprises at least one initial pre-wash phase (PF1 ; PF1") at a low temperature immediately followed by a second pre-wash phase (PF2 ; PF2") at a low temperature.

FIG. 1



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The present invention refers to a dish-washing machine having various washing programs comprising one or more phases (pre-wash, washing, rinse, Etc) apt to be utilized preferably for the washing of domestic dishes.

As known, the functioning of dish-washing machines, and in general the functioning of all domestic washing machines, is realized by means of a mechanical action, a chemical action and a thermic action, said actions being carried out together or separately.

The mechanical action is realized by means of jets of washing liquid that strike the dishes (or from the movement of garments in the liquid, in the case of laundry washing machines); the chemical action is realised with detergents and by washing additives; the thermic action is based on the different temperatures that the washing liquid may have, in consideration of the fact that a hot liquid removes residues more effectively than a cold liquid.

In dish-washing machines such actions can be realized together and separately, as, for example, in cold pre-wash phases, without the use of detergents, only a mechanical action is realised; in hot wash phases the three actions are simultaneously realised; in hot pre-wash phases only the mechanical and the thermic actions, and so on.

On the grounds of these considerations dish-washing machines are realized in order to generally provide for different kinds of washing programs; such different programs are controlled by a suitable programming device, and are selected by the user on the grounds of his needs and on the quantity and characteristics of the soil to be removed. More in detail, dish-washing machines can generally present the following programs:

- A standard or basic washing program;
- an intensive washing program;
- an economic washing program;
- a rapid washing program;
- a soaking program.

The standard washing program of a dish-washing machine is that typically selected for the washing of dishes that have a normal degree of residues and a certain dryness degree. Such program generally comprises a cold pre-wash, a washing phase at 65°, a first and a second cold rinse (in present day washing machines the tendency of realising a single cold rinse is wide spread), a hot rinse and of a final drying phase.

The intensive washing program is that utilized in the case in which dishes are very soiled or the food residues are particularly difficult to remove (for example very dried or burnt residues). Such program generally comprises a hot pre-wash, a washing phase at 65°, a first cold rinse, a second cold rinse, a third hot rinse at 65° and a final drying phase.

The economic washing program is utilized for slightly soiled dishes (for example partial loads or

dishes with easily removable residues and being composed of plates and glasses without saucepans); it generally consists of a cold pre-wash, a hot washing phase at 55°, a first cold rinse, a second hot rinse at 55° or 65° and a final drying phase.

The economic program, therefore, is a "reduced" standard program as, due to the characteristics of the residues that must be removed, it has one less cold rinse and the hot washing phase may be carried out at 55° rather than at 65°; it thus allows for the saving of electric energy and of water if compared to the standard program.

The rapid washing program however includes a wash at 55°, a single cold or hot rinse at 55° (and an eventual final drying phase). It is utilized in similar cases to the previous, in particular when one wishes to have the washed dishes more rapidly with partial loads.

In the abovementioned programs, the phases named "washing phases" and "hot rinse" are naturally realized with the suitable contribution of detergents and rinsing additives, that the user has loaded in suitable dispensers of the dish-washing machine. When the quantity of dishes to be washed upon the termination of a meal is limited, it may be convenient to adjourn the washing to a successive period; for this reason dish-washing machines are also generally provided with a program for soaking only, that consists in a rapid wetting of the dishes, that is used to moisten and detach the larger particles of the residues and delay the washing of these few dishes until the termination of the successive meal.

It is to be noted that appropriate regulations establish that the base program, or standard, as previously defined, of dish-washing machines must be able to wash the dried residues (i.e. residues of food that if not eliminated immediately after a meal harden and stick to the dishes); in daily reality, however, the above washing programs are generally carried out immediately by the user, that is when the residues are, so to speak, still fresh.

The present invention is actually based on the recognition of the fact that in normal conditions dishes are washed directly after a meal, i.e. when the residues are still fresh and that therefore an important result in the removal of the residues may be obtained in virtue of the sole mechanical washing action.

In view of this, the aim of the present invention is that of indicating a dish-washing machine equipped with a new program or procedure for the washing of dishes to be utilized when the residues are still fresh, which, in considering the results and water used if compared to a normal washing program, privileges the mechanical action for the removal of the residues and allows an important saving of energy, of time and of detergents.

According to the present invention, such aims are reached through a dish-washing machine having va-

rious washing programs comprising one or more phases (pre-wash, washing, rinse, Etc) apt to be utilized preferably for the washing of domestic dishes, characterised by the fact of providing a program particularly apt for the removal of fresh residues from the dishes, that comprises at least one initial pre-wash phase at a low temperature immediately followed by a second pre-wash phase at a low temperature.

Further aims and advantages of the present invention result in being clear from the following description and annexed drawings, supplied purely as an explanatory and non-limiting example, wherein:

figure 1 represents, by way of a functional diagram that also reports the duration times of the different phases, the development of a standard program for the washing of dishes (base cycle) compared with the development of a washing program of a dish-washing machine according to present invention;

figure 2 represents, by way of a functional diagram, that also reports the duration times of the different phases, the development of a dish washing program or procedure according to a possible variation of the dish-washing machine object of the present invention.

Taking for granted the known art constituted by modern dish-washing machines, the present invention shall be schematically described, with reference to figure 1 and therefore to the known standard program of a traditional dish-washing machine.

The development of such standard programs of a known dish-washing machine, represented in part A of the diagram in fig. 1, may be approached very schematically in the following way.

During the cold pre-wash phase, indicated with PF, a determined quantity of water, withdrawn from the water mains, is made to reach the washing tub and a pump arranged on the bottom of the same sends it to the rotary sprinklers; through the sprinklers the water is sprayed over the dishes. The water that cascades to the bottom of the tub, after having been filtered, is withdrawn by the pump and re-conveyed to the sprinklers, and so on, until to the termination of the pre-wash phase PF, the duration of which being about 4 minutes. Upon termination of this phase, characterized by a mechanical action, the water is discharged from tub.

The following phase, constituted by the hot wash indicated with LC, is substantially similar, from a point of view of the mechanical action, to the cold pre-wash phase; it does consist moreover in the fact that the water introduced to the tub and sprayed on the dishes is heated and maintained at a temperature of around 65° (thermic action) by suitable electric resistors, and that a washing powder dispenser introduces detergents to the tub, that is mixed with the water (chemical action). Also upon the termination of this phase, the duration of which being around 30 minutes, the

water is discharged from the tub.

The successive phase, constituted by the cold rinse, indicated with RF, substantially similar to the pre-wash phase PF; the duration of which is however less than 2 minutes approximately (in the case represented, the standard cycle provides for a single cold rinse phase, being quite different to that which occurred in the older type of dish-washing machine, that had two distinct cold rinses).

The fourth phase, constituted by the final hot rinse indicated with RC, substantially similar to the hot wash, inasmuch the water for the rinse is heated to 65° by the previously mentioned resistances; in place of introducing detergents in the tub, however, the washing powder dispenser in this case introduces the rinsing additives. Such phase has a duration of typically about 20 minutes.

In the final phase, that of the drying, indicated with AS, air is placed in circulation within the washing tub, for favouring the removal of the water from washed dishes (or more commonly the residual heat of same dishes is utilised).

As is noted, for every washing phase, clean water is withdrawn from the water mains to then be discharged once the phase has terminated; it is further noted that the hot phases are preceded by the cold phases.

According to the present invention, the dish-washing machine is equipped with a washing program to be utilized for fresh residues, that provides for two phases being substantially cold or at a low temperature, followed by two hot phases, and eventually by a drying phase. The development of such program of the dish-washing machine according to the present invention is illustrated in part B of figure 1.

The first phase is a pre-wash phase, indicated with PF1, realized with cold water and without the use of detergents. This phase realises a mechanical action that allows for the removal of the greater part of the residues. This phase is similar to the cold pre-wash phase of the standard program previously described and has the same duration, i.e. about 4 minutes; upon termination of such phase the water is discharged from the dish-washing machine.

The second phase of the program of the machine according to the present invention, a second cold pre-wash indicated with PF2, is substantially identical to the first, but through it the removal of part of the residues that remain after the first pre-wash phase PF1 is obtained; in virtue of the fact that the residues, being relatively simple to remove inasmuch they are fresh, have already undergone a first mechanical action. Also upon termination of this phase, that lasts approximately 4 minutes as in the previous phase, the water is discharged from the machine.

The third phase, indicated with LC' is an actual washing phase, i.e. characterized by the heating of the water and the introduction of detergents in tub.

From a conceptual viewpoint it is identical to the hot wash of the standard cycle, but it may be realized at a lower temperature than that of the standard cycle indicated in part A of the figure (in the specific case at 55°) and with a reduced quantity of detergents, as the thermic and chemical actions must only be exercised on the residues remaining on the dishes after the two previous cold pre-wash phases.

For the same reason its duration may be substantially lower compared with the standard cycle, i.e. only 20 minutes.

The fourth phase a hot rinse phase, indicated with RC'; this phase is also similar to a hot rinse phase of the standard cycle; in such a phase the rinse liquid is heated to 65°, but the required amount of time required for the heating of the water introduced in the tub is considerably reduced if compared to the time needed in the standard cycle, the quantity of electric energy required also results in being greatly reduced. In fact, after the hot wash phase, the washing tub, that is generally made of steel, and the dishes inside are still hot.

A recovery of thermic energy is therefore realised, due to which the heating of the rinsing water that is introduced in the basin is facilitated and made more rapidly, with consequent savings of electric energy and of cited time.

After the fourth phase, as for the standard cycle, the washing program can eventually be provided with a drying phase of the dishes, in the known way.

From practical tests carried out it has been verified that the dish-washing machine object of the present invention allows for obtaining on fresh residues, in a greatly reduced time and with a reduction of electric energy consumption, the same level of cleanliness of the dishes obtained with a known standard washing cycle.

According to the invention the program described will be advantageously provided as a supplementary cycle of the machine, i.e. as a washing program to flank those normally provided on modern dish-washing machines and will be naturally commanded and selectable by the programmer that supervises the different washing cycles or with switch buttons or rotary selectors.

From the executed description the characteristics of the dish-washing machine object of the present invention result in being clear, as do its advantages.

In particular they are represented in that with the described dish-washing machine the removal of fresh residues, with a parity of water used and if compared to a basic washing program, allows to obtain a considerable reduction:

- of the overall time of the washing cycle, due to two successive cold pre-wash phases and to two successive contiguous hot functional phases; in fact with the two pre-washes a major quantity of fresh residues is removed be-

forehand than is normally so and the hot washing phase is exercised only on the remaining residues; furthermore the heating of the water for the hot rinse, that immediately follows the hot wash, is reached more rapidly, in virtue of the thermal recovery due to the fact that the washing tub and dishes are still hot;

- of electric energy, for the same reasons a reduction of time is also obtained; in fact the washing and the rinsing may be of shorter duration than normal and the energy required for bringing the rinsing water to temperature will be minor, due to the mentioned thermal recovery;
- of detergents, as, in virtue of the fact that the residues are fresh, the mechanical washing action is privileged, by way of the two pre-washes: the detergents required are thus minor.

It is clear that numerous variants are possible to the dish-washing machine object of the present invention, without for this departing from novelty principles inherent of the inventive idea; one of possible variants is hereinafter described with reference to figure 2.

Based on such variant the dish-washing machine is equipped with a program that provides a first cold pre-wash phase, indicated with PF1", similar to phases PF1 and PF, but which lasts for about two minutes only. The second pre-wash phase, indicated with PF2", is however realized with water of a low temperature, i.e. approximately 30-35°, and for a period of time of approximately 6 minutes. Therefore in such phase the water is heated by the resistances of the machine and thus to the prevalent mechanical action on the fresh residues remaining from first pre-wash PF1" a slight thermal action is added.

Also according to the variant of figure 2, upon terminating each of the two successive initial pre-wash phases PF1" and PF2" the water is discharged from the machine.

The successive phases of the cycle, i.e. the hot wash indicated with LC", the hot rinse indicated with RC" and the eventual drying phase indicated with AS", are identical of those described with reference to part B of figure 1.

As is noted, therefore, the total time of the two pre-wash phases PF1 and PF2 and that of the two phases PF1" and PF2" is the same, as they are substantially equal to the compressive times of the cycle of figure 2 and the cycle of the part B of figure 1.

In any case, the fact that the second pre-wash phase PF2" is realized with lukewarm water allows to obtain a slight thermal recovery in favour of the hot wash phase LC", that could therefore be of a duration being less than 20 minutes.

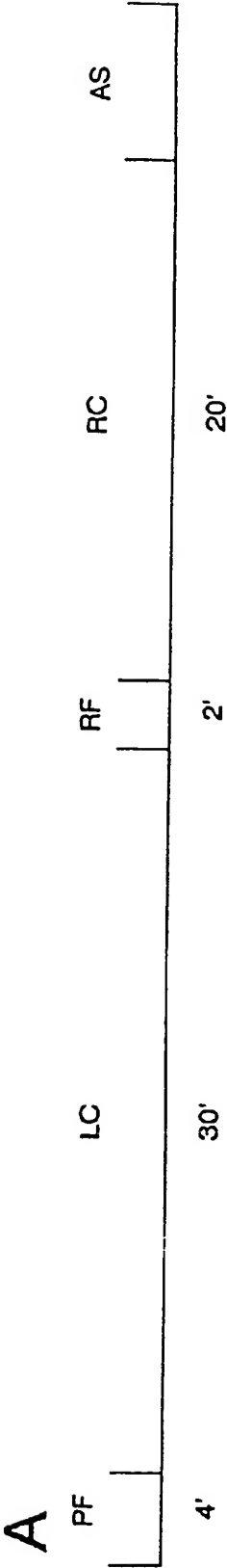
Claims

1. Dish-washing machine having various washing programs comprising one or more phases (pre-wash, washing, rinse, etc) apt to be utilized preferably for the washing of domestic dishes, characterised by the fact of providing a program particularly apt for the removal of fresh residues from the dishes, that comprises at least one initial pre-wash phase (PF1; PF1'') at a low temperature immediately followed by a second pre-wash phase (PF2; PF2'') at a low temperature. 5
2. Dish-washing machine, according to claim 1, characterised in that upon termination of each of said low temperature pre-wash phases (PF1, PF2; PF1'', PF2'') the water utilized during the course of each of such phases is discharged from the dish-washing machine. 10
3. Dish-washing machine, according to claim 2, characterised in that the two said low temperature pre-wash phases (PF1, PF2; PF1'', PF2'') are followed by a hot wash phase (LC'; LC''), with the introduction of washing additives to the tub of the dish washing machine. 15
4. Dish-washing machine, according to claim 3, characterised in that said hot wash phase (LC'; LC'') is immediately followed by a hot rinse phase (RC'; RC''). 20
5. Dish-washing machine, according to claim 4, characterised in that during said hot rinse phase (RC', RC'') rinsing additives are introduced to the washing tub of the dish-washing machine. 25
6. Dish-washing machine, according to claim 3, characterised in that in order to reduce the duration of said hot wash phase (LC' ;LC''), also with the washing liquid being of an equivalent temperature, if compared to the duration of the hot wash phase (LC) of a standard dish washing cycle, two successive low temperature initial pre-wash phases (PF1, PF2; PF1'', PF2'') are provided. 30
7. Dish-washing machine, according to claim 4, characterised in that in order to reduce the duration of said hot rinse phase (RC'; RC''), also with the rinse liquid being of an equivalent temperature, if compared to the duration of the hot rinse phase (RC) of a standard dish washing cycle, a hot wash phase (LC', LC'') is provided immediately before the hot rinse phase (RC'; RC''). 35
8. Dish-washing machine, according to claim 4, characterised in that said hot rinse phase (RC'; 40

RC'') is followed by a drying phase (AS'; AS'').

9. Dish-washing machine, according to at least one of the previous claims, characterised in that in order to require an overall time being considerably less if compared to the overall time required by a standard washing cycle, also using the same temperatures, two successive initial low temperature pre-wash phases (PF1, PF2; PF1'', PF2'') and a hot wash phase (LC'; LC'') immediately followed by a hot rinse phase (RC', RC'') are provided. 45
10. Dish-washing machine, according to at least one of the previous claims, characterised in that both said low temperature pre-wash phases (PF1, PF2) are realized with cold water without the actuation of heating resistances of the dish-washing machine. 50
11. Dish-washing machine, according to at least one of the previous claims, characterised in that said low temperature pre-wash phases (PF1, PF2) are substantially identical. 55
12. Dish-washing machine, according to at least one of the claims from 1 to 10, characterised in that the first (PF1'') of said low temperature pre-wash phases (PF1'', PF2'') is realized with cold water and that the second (PF2'') of said low temperature pre-wash phases (PF1'', PF2'') is realized with lukewarm water.
13. Dish-washing machine, according to the previous claim, characterised in that said lukewarm water is heated by the actuation of heating resistances of the dish-washing machine to a temperature of approximately 30-35 degrees.
14. Dish-washing machine, according to claims 12 or 13, characterised in that the second of said low temperature pre-wash phases has twice the duration of said first low temperature pre-wash phase.
15. Procedure for the washing of dishes, according to at least one of the previous claims, characterised in that it provides two phases being substantially of a low temperature (PF1, PF2; PF1'', PF2''), followed by two hot phases (LC', RC'; LC'', RC'').
16. Procedure for the washing of dishes, according to at least one of the previous claims, characterised in that it is provided as an additional washing cycle in relation to the washing cycles normally provided in a domestic dish washing machine.

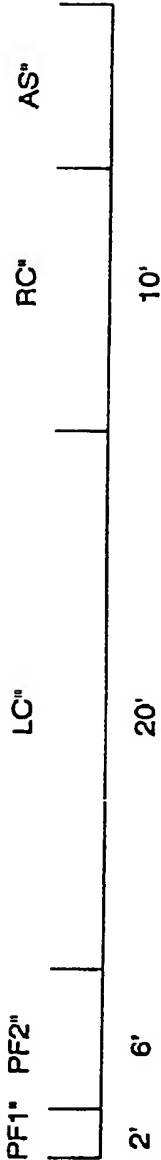
FIG. 1



B



FIG. 2





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EUROPEAN SEARCH REPORT

Application Number

EP 93 10 1244

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.5)
X	US-A-4 070 204 (A.L. HARDY ET AL.) * the whole document * ---	1-6, 8-11,15, 16	A47L15/00 D06F35/00
X	US-A-4 559 959 (T.F. MEYERS) * the whole document * ---	1-5, 8-12,15, 16	
A	US-A-4 366 005 (I. OGURI ET AL.) * the whole document * ---	1-9, 11-16	
A	US-A-2 390 757 (M.A. VORIS) * the whole document * ---	1-4, 8-11,15	
A	GB-A-2 139 083 (BOSCH-SIEMENS HAUSGERÄTE GMBH) * the whole document * ---	1-15	
A	GB-A-2 052 957 (INDUSTRIE A. ZANUSSI S.P.A.) * the whole document * ---	1,15	TECHNICAL FIELDS SEARCHED (Int. Cl.5)
A	GB-A-1 021 051 (HOOVER LIMITED) * the whole document * -----	15	A47L D06F
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 24 MAY 1993	Examiner KELLNER M.
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